

Cima Dome Joshua Tree Planting Protocol

National Park Service, Mojave National Preserve

Background

The main objective of the restoration is to ensure Joshua trees are present and reproducing throughout the Cima Dome. Cima Dome has been predicted by researchers to be a climate refugia for the species. A refugia is a place where adequate environmental conditions will continue to exist for a species in the wake of changing climate patterns. Through satellite imagery, we have identified badly affected areas of the 2020 Dome Fire where nearly 100% of the aboveground vegetation was completely burned. We will be planting groups of Joshua trees with the hopes that they can survive and provide a seed source for the natural repopulation of the worst areas of the fire. But wait there's more, Cima Dome is about two-thirds designated Wilderness. So instead of caging all plants, which we believe will help protect against herbivory but would be an issue in the eyes of the Wilderness Act, we are performing an experiment during the first year of plantings to determine if they are necessary to achieve adequate survival rates. The results from the first year of planting will inform the next three years of planting. That's right! We will have 3 more years of planting fun! Volunteers this year will be given priority in future planting parties.

Planting Treatments:

At each planting site/group, you and your team of 5-6 people will be planting 6 Joshua trees in 4 different ways. The ways, or treatments, in which they are planted has been pre-determined and will be given to you once your team is assigned a grouping. The 4 different planting treatments are as follows:

- **OC – Open, caged** – Plant Joshua tree at least 3 meters (about 10ft), away from the nearest live or dead shrub. Once planted, install cage around plant. Attach ID tag to top of cage with bailing wire.
- **OX – Open, not caged** – Plant Joshua tree at least 3 meters from nearest live or dead plant. Install ID tag to berm with landscaping staple.
- **PC – Under a nurse plant, caged** – Plant Joshua tree within 1 meter of live (preferred) or dead shrub. Joshua tree should be roughly on the north side of the nurse plant. Once planted, install cage around plant. Attach ID tag to top of cage with bailing wire.
- **PX – Under a nurse plant, not caged** - Plant tree according to previous description, but do not install cage. Install ID tag in berm with landscaping staple.

Example: Group 42 = OC, OX, PC(x 4)

Group 85 = OC, OX(x 2), PC(x 2), PX

Materials for 1 Grouping:

- 5 gal bucket for carrying Joshua trees
- 6 Joshua tree seedlings
- Digging tools (Spade/shovel/sharpshooter/posthole digger)
- 4 gallons of water (minimum)
- 1 wire mesh fence per caged (C) Joshua trees
- 1 rebar per caged Joshua tree
- 6 Landscaping staples
- 6 ID tags
- Work gloves
- Mallet/hammer for installing rebar
- Wire bits (4 per caged Joshua tree = 3 per rebar + 1 per ID tag)
- Phone w/Survey123 map
- Battery charger

Planting Procedure

1. Using Survey123, navigate to your assigned planting location/group. Once you arrive at the site, decide as a group where each plant will go based on the assigned treatments for that grouping. For seedlings going under nurse shrubs (P), the planting location **must be on the north side** of the shrub, and with at least partial shade from the nurse plant (within 1 meter or 3 feet). North is towards I-15 or away from the powerlines. Do not plant the trees too close to the central root zone as this will probably kill the nurse plant. For most of the planting locations, there should be enough live nurse plants available (we surveyed ahead of time); however, if there are not enough for your assigned grouping, dead shrubs are acceptable as long as they are rooted in the ground and they provide a reasonable amount of shade. Trees planted in the open (O) need to be planted at least 3 meters, or 10 feet, from the closest shrub. All plants should be spaced at least 4-5 meters, about 15 feet, apart at a minimum.

Diagrams for planting in unburned islands:

Figure 1. Correct

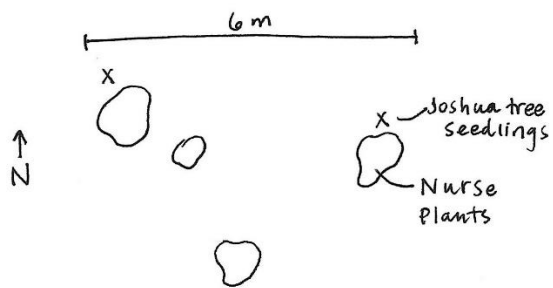


Figure 1. Plants are spaced at least 4-5 meters apart. All plants are on the north side of the nurse plants.

Figure 2. Incorrect

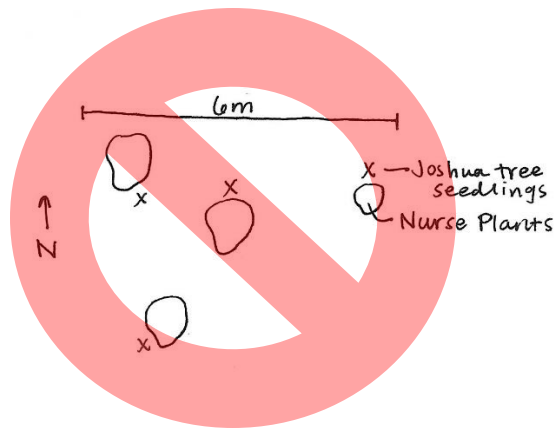


Figure 2. Too many plants are planted in the unburned island, resulting in plants being too close together. Plants are also not all planted on the north side of the shrubs.

Diagrams for planting near nurse shrubs:

Figure 3. Correct

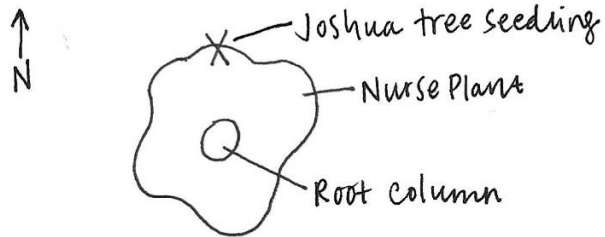


Figure 4. Correct

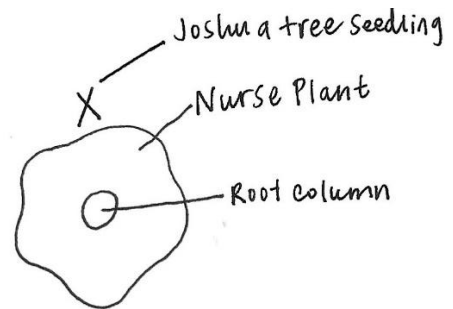


Figure 5. Incorrect

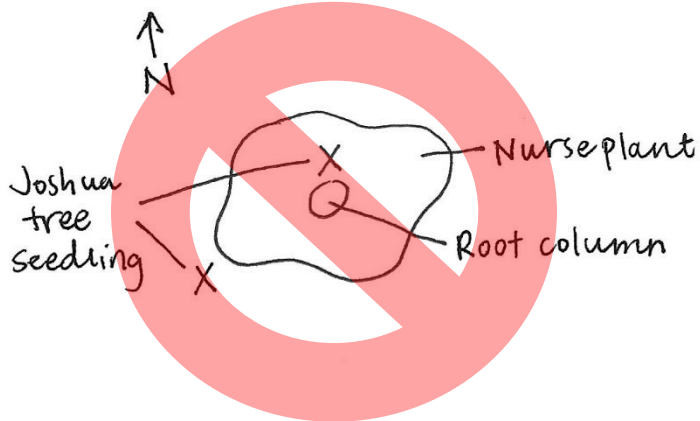


Figure 3 & 4. Correct planting orientation. On the north side, in the shade of the plant, and not too close to the root column.

Figure 5. Incorrect, the top plant is too close to the root column, and the bottom plant is not on the north side of the shrub.

2. Digging holes: Holes should be dug just deep enough so that the top of the soil level in the pot is level with the ground surface. Any higher and the roots will be exposed due to erosion, causing serious stress to the plant. Try to keep the width of the hole to about twice the width of the pot, but this will depend on the digging tool you are using. Test the depth by using a digging tool or your arm and comparing it to the depth of the soil in the pot. Once the hole is deep enough, use a small amount of your half gallon (up to a pint) to wet the sides and bottom of the hole.

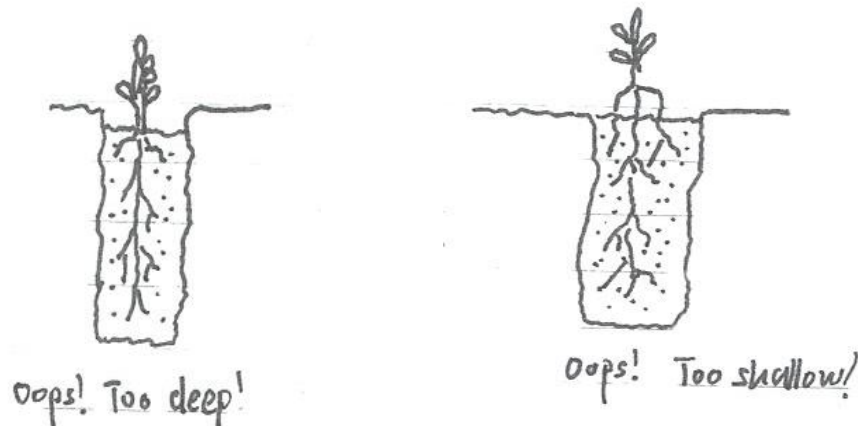


Figure 6. Make sure the plant is not planted too shallow or too deep. Doing so can decrease the plant's chance to survive in the following years. Drawings from Joshua Tree National Park Outplanting Handbook

3. Place the container on its side and split open the paper band along a seam, trying not to disturb the soil and roots as much as possible, creating a paper raft of sorts with the plant in a horizontal position. With the help of another, begin sliding the plant on the paper raft into the hole while the other person pushes in dirt to fill the hole. Support the base of the plant with one hand and roots with another. When the hole is mostly filled, pull out the paper raft and fill the hole to match ground level. Be sure to leave some dirt for making the berm in Step 6.
4. Using your hands, press down on the dirt around the plant to make sure it is somewhat compacted. If the dirt is not, the plant could sink several inches below the ground surface with a large rain event. Ensure that the roots of the plant are not showing. If they are, using dirt to fill in more around the plant.
5. **Caging Plants:** If your plant was assigned caging, take your flattened cage and bend it back into a cylinder. Place the cage around the tree. Hammer the rebar into the ground on outside of the cage on the northside. The rebar doesn't have to be level with the top of the cage. The rebar should be firmly in the ground (jackrabbit test). Use three bits of wire to attach the cage to the

rebar, 4-5 twists should be enough. Once the rebar is attached, secure the opposite side of the cage to the ground with a landscaping staple.

6. **Building a berm**: All plants, caged or not, will need a berm constructed around them. A berm is a few inches of soil built up around the base of the plant to retain water and to keep herbivores out of the cage. Using the remaining excavated soil, build up a circular berm around the plant, covering the bottom of the cage so that there are no gaps. If no cage, create a berm around the plant, leaving ample room between the berm and plant. The berm should be about 1.5 feet in diameter. A berm should be 4-5 inches tall. Use your hands and feet to pack the berm to ensure it is compact, as water and wind will erode them over time.
7. Use the rest of the half gallon to water the plant. Water slowly and use this time to check for any weak spots in the berm. If water is escaping the berm, use more soil to reinforce it.
8. **Tagging Plants**: To tag the caged plants, use a wire bit to attach the tag to the lower half of the rebar. For uncaged plants, use a landscaping staple and install the ID tag on the outer edge of the berm.



A successful caged outplant on the north side of the nurse plant. notice the berm is covering the bottom of the cage, and is retaining the water. The ID tag is attached to the lower portion of the rebar.

9. Once the plants are in the ground and tagged, use the Survey123 app to submit information on the plant. Please make sure to fill out all boxes, and make sure your photos are clear/focused and correctly oriented.